Regenerative Solutions for Managing Community-generated Organic Waste

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Stephen Dale

[Photo: Duckweed lagoon in Bangladesh.]

Gregory Rose is searching for a silver lining in one of the world's most pressing environmental and public health problems: what to do with the increasing amounts of human waste, also known as 'black water'.

Over the past 50 years, the volume of domestic sewage produced globally has more than doubled, rising from a daily output of 3.2 million tonnes in 1950 to a projected daily output of 8.5 million tonnes in 2000 — or 3 billion tonnes per year. Much of that sewage is generated in the rapidly urbanizing areas of the South, creating the same kind of public health crisis for developing countries that led to the so-called 'sanitary reforms' in 18th century Europe.

Inappropriate solution

But the European solution — building highly centralized, capital intensive, and elaborately engineered sewage treatment systems — seems poorly suited to the reality faced by developing countries today. "In the developing world, they are just not able at this point to finance, maintain, and effectively operate the conventional wastewater treatment plants used in the North," says Rose, a PhD candidate in the School of Planning at the University of Waterloo in Canada, and author of an International Development Research Centre report, published by the Cities Feeding People (CFP) program initiative, on community-based technologies for treating domestic wastewater.

In fact, for cash-strapped developing nations to even attempt to treat sewage with expensive, electro-mechanical plants may actually make the public health problem worse, adds Rose. "What we are finding with the conventional, highly capitalized infrastructure is that developing countries may get them off the ground through initial donor support and they may function very well at first. But they need very high levels of maintenance, and the costs of electricity and other inputs are very high," he explains. As time passes, "the plants start breaking down and no longer treat sewage to 'tertiary' or acceptable levels. So you're getting partially treated wastewater discharged into water bodies and potentially harming sensitive coastal zone regions that the largest portion of the human population depends on for their livelihood."

Eutrophication

As a result, disease-promoting human waste is shifted downstream from individual communities, creating a broader health hazard for society. For example, discharging inadequately treated sewage into coastal waters can trigger 'eutrophication' (the rapid and abundant growth of algae) by providing the nitrogen, potassium, and phosphorus that algae need to proliferate. Moreover, there is evidence suggesting that eutrophized coastal areas provide a safe harbour and breeding ground for new environmentally resistant strains of cholera, which survive longer in the environment. (The 1993 cholera outbreak in Peru, for instance, has been directly related to the discharge of untreated sewage.)

Fortunately, this crisis is forcing public health officials and non-governmental organizations (NGOs) to investigate new and better waste-treatment techniques, says Rose. His report catalogues and assesses a variety of 'regenerative' technologies that can produce useful value-added end products. "We have to start viewing our finite but potentially renewable organic waste as a usable resource," he says.

'Closed-loop' systems

What these 'closed-loop systems' ultimately produce depends on how effectively they treat waste. For example, techniques that kill viruses, bacteria, and other pathogens the most efficiently may yield fertilizer for crops intended for human consumption. Other methods that are less expensive to implement may kill pathogens less reliably, but the wastewater can be used to produce fertilizer for fibre crops — such as hemp or bamboo — or new energy sources, such as biogas.

Rose stresses that there is a broad range of low-tech waste treatment systems available today, and that communities can choose the systems that best address their needs. For example, in squatter communities and shantytowns, sewage disposal is often limited to digging trenches that divert wastewater away from homes and down to the lowest point of gravity. But this just transfers the waste to neighbouring communities or nearby patches of ground where children may walk or play. Here, simple composting toilets may be the most appropriate technology because one low-cost, low-maintenance facility can be shared by several families. Among the different options available, one variety of composting toilet allows liquid waste to drain into a greenhouse structure, where bamboo or other fibre products can be grown.

Wastewater lagoons

On a larger scale, one of the most effective means of killing pathogens is to divert sewage into wastewater lagoons that contain water-borne, harvestable plants such as duckweed, which thrive on the nutrients in wastewater and produce a usable animal and fish forage. A major drawback, however, is that these lagoons take up a lot of space. This is especially a problem in densely populated areas where land can be very expensive. To justify the cost of land, Rose argues that some economic return must be realized from new waste treatment projects. Moreover, the costs faced by community members should be on par with — or preferably less than — what people now pay to private operators to pump out and maintain their septic tanks.

According to Rose, none of the technologies discussed in his report are second-rate or primitive. "These are technologies for the 21st century," he insists. "The opportunity I see for developing countries is to leapfrog over the dinosaur technologies we have funded and implemented in the North, and move to these advanced technologies. [This is analogous to] the adoption of cellphone technology in the developing world. They have leapfrogged over the use of telephone poles and underground cable systems, which are very expensive infrastructure, and gone directly to satellite communications."

Potential benefits

One potential obstacle, however, is unreceptive national governments, since "centralized, highly capitalized infrastructure brings in money at the governmental level." But Rose adds that governments stand to benefit from the use of closed-loop waste management systems, which promise to lower demand for imported chemical fertilizers — thereby conserving precious foreign exchange reserves — and to provide domestic sources of food, fibre, and energy, while reducing the amount of agricultural runoff.

Already his message is being heard. In October 1999, Rose was invited by the Integrated Biosystems Network, supported by the United Nations University - Institute of Advanced Studies in Tokyo, to lead a month-long online seminar using the concepts outlined in the CFP report to promote discussion. And in July 2000 he will begin a study in Belize on the feasibility of using low-input, community-based technologies to treat tourism-generated organic waste. This research will also examine how the tourism sector, adjacent communities, and local agricultural producers can share the benefits from reusing organic waste. This is just one of many locales where alternative waste management strategies and planning approaches can offer multiple benefits over the long-term.

Stephen Dale is an Ottawa-based writer. (Photo: G. Rose)

If you have any comments about this article, please contact info@idrc.ca .

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